

WHAT IS CLAIMED IS:

1           1. A method for identifying protocol encapsulation in received  
2 network data comprising providing a grammar and parsing incoming network data using  
3 said grammar, said network data being organized into data packets.

*Sub A3*  
1           2. The method of claim 1 wherein said grammar is a grammar graph,  
2 the method further including providing a deterministic finite automaton (DFA)  
3 representing said grammar graph

1           3. The method of claim 1 further including scanning said incoming  
2 network data using lexical token scanning to produce plural lexical tokens, said step of  
3 parsing including parsing said lexical tokens.

1           4. The method of claim 3 wherein said lexical scanning includes  
2 providing a set of regular expressions.

1           5. The method of claim 3 further including providing a deterministic  
2 finite automaton (DFA), said DFA including a representation of said lexical tokens and  
3 said grammar, said step of scanning including recognizing lexical tokens contained in  
4 said data packets using said DFA, said step of parsing including identifying grammatical  
5 structure among said lexical tokens using said DFA to identify protocol encapsulation in  
6 said incoming network data.

1           6. In a data packet network switching device, a method for processing  
2 data packets comprising:

3                 providing a grammar;  
4                 receiving plural data packets, each having a length not necessarily equal to  
5 one another; and  
6                 for each data packet, lexically scanning said data packet to produce plural  
7 lexical tokens, parsing said lexical tokens to produce one or more identified protocols,  
8 and processing said data packet based on said identified protocols.

1           7. The method of claim 6 further including compiling said grammar  
2 to produce a grammar graph.

1           8.     The method of claim 7 wherein said lexical scanning includes  
2 providing regular expressions for identifying said lexical tokens.

1           9.     The method of claim 8 further including compiling said regular  
2 expressions into a deterministic finite automaton (DFA).

1           10.    The method of claim 9 further including incorporating said  
2 grammar graph into said DFA.

1           11.    In a data packet receiving and forwarding device, a method for  
2 processing data packets comprising a stream of data, said method comprising:

3                 receiving a description of grammar rules in a grammar packet  
4 classification language;

5                 compiling said grammar packet classification language to produce a  
6 grammar graph;

7                 configuring a programmable grammatical packet classifier with said  
8 grammar graph;

9                 parsing said data stream with said grammatical packet classifier to identify  
10 a protocol structure in a received data packet; and

11                 processing said received data packet in accordance with said protocol  
12 structure.

1           12.    The method of claim 11 further including:

2                 receiving a description of classification rules in a lexical classification  
3 language;

4                 compiling said classification language to produce a deterministic finite  
5 automaton (DFA) comprising plural states;

6                 configuring said hardware packet classifier with said DFA; and

7                 scanning said data stream with said hardware packet classifier to produce  
8 plural lexical tokens,

9                 wherein said parsing is a step of parsing said lexical tokens.

1           13.    The method of claim 12 wherein said grammar graph is  
2 incorporated into said DFA.

1           14.     The method of claim 12 wherein said lexical classification  
2 language includes regular expressions.

1           15.     The method of claim 14 wherein said regular expressions include  
2 arithmetic and logic operations.

1           16.     The method of claim 15 wherein said regular expressions further  
2 include skip operations.

1           17.     The method of claim 16 wherein said regular expressions further  
2 include data storage operations.

1           18.     A network data packet classifier comprising:  
2               an input port for receiving network data packets comprising a stream of  
3 data;

4               a memory assemblage configured with data representing a deterministic  
5 finite automaton (DFA), said DFA representing a grammar graph and plural regular  
6 expressions; and

7               decompression logic operatively coupled to said memory assemblage and  
8 configured to scan said stream of data with said DFA to find a matching one of said  
9 regular expressions thereby producing plural lexical tokens,

10          said decompression logic further configured to parse said lexical tokens  
11 with said DFA to identify a protocol structure in a received network data packet,

12          wherein processing of said network data packet depends on said protocol  
13 structure.

1           19.     The classifier of claim 18 wherein some of said regular expressions  
2 include arithmetic instructions and logic instructions, said memory assemblage further  
3 configured to contain said instructions, the classifier further including an arithmetic logic  
4 unit operatively coupled to said decompression logic and configured to execute said  
5 instructions.

1           20.     The classifier of claim 19 further including at least one register  
2 operatively coupled to said arithmetic logic unit, said arithmetic logic unit further  
3 configured to store data into said register in response to a save instruction.

1                   21. The classifier of claim 19 further including skip logic operatively  
2 coupled to said logic component and configured to skip over an amount of data in  
3 response a skip instruction.

1                   22. The classifier of claim 18 wherein said network data packets can  
2 vary from one packet to another.

1                   23. The classifier of claim 18 wherein said DFA is in compressed  
2 form.

1                   24. The classifier of claim 23 wherein said DFA comprises plural non-  
2 default states and plural default states, and said memory assemblage comprises a base  
3 memory, a next-state memory, and a default-state memory; said base memory configured  
4 to contain address locations of said next-state memory, said next-state memory  
5 representing all of said non-default states, said default-state memory representing all of  
6 said default states.

1                   25. The classifier of claim 24 wherein said memories are random  
2 access memories.

1                   26. The classifier of claim 24 wherein said memories are read-only  
2 memories.

1                   27. A network packet classifier comprising:  
2 means for receiving an incoming network packet; and  
3 means for identifying protocol structure in said network packet including  
4 means for scanning to match patterns in its constituent data against plural regular  
5 expressions to produce lexical tokens and means for parsing through said lexical tokens  
6 using a grammar.

1                   28. The classifier of claim 27 wherein said means for scanning  
2 includes a memory component configured with data to represent a deterministic finite  
3 automaton (DFA).

1                   29. The classifier of claim 28 wherein said memory component is  
2 further configured to include said grammar.

1           30. The classifier of claim 27 wherein said regular expressions include  
2 arithmetic specifiers and said means for classifying includes an arithmetic logic unit  
3 configured to perform operations in accordance with said arithmetic specifiers.